Civil Engineering 4 Real (CE4R)

Project & Problem Based Learning for Undergraduate Civil Engineers

2012-2018

- 67 x 2hr workshops (Monday 5-7PM)
- 357 undergraduate students attended 1 or more workshops (years1-5)
- 1571 student attendances
- 1571 X 2hrs= 3142 hours of CPD created
- (n=1477) returned questionnaires from 1571 student attendances
- 45 industrial partners (19 contractors / 21 consultants / 5 clients)
- 132 industry workshop presenters
### Table 1: CE4R- Industrial Partners 2012-2018

<table>
<thead>
<tr>
<th>Contractors (19)</th>
<th>Consultants (21)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Balfour Beatty</td>
<td>AECOM</td>
</tr>
<tr>
<td>Bam Nuttall</td>
<td>Arup</td>
</tr>
<tr>
<td>Brookfield Multiplex Europe</td>
<td>Arch Henderson</td>
</tr>
<tr>
<td>Carillion</td>
<td>Atkins</td>
</tr>
<tr>
<td>Forth Crossing Bridge Constructors</td>
<td>Baker Hicks</td>
</tr>
<tr>
<td>Graham</td>
<td>Buro Happold</td>
</tr>
<tr>
<td>I&amp;H Brown</td>
<td>CH2M</td>
</tr>
<tr>
<td>Kier</td>
<td>COWI</td>
</tr>
<tr>
<td>Lagan</td>
<td>David Narro Associates</td>
</tr>
<tr>
<td>Laing O’Rourke</td>
<td>Fairhurst</td>
</tr>
<tr>
<td>Lend Lease</td>
<td>Grontmij</td>
</tr>
<tr>
<td>McLaughlin &amp; Harvey</td>
<td>Jacobs</td>
</tr>
<tr>
<td>Morrison</td>
<td>Mott Macdonald</td>
</tr>
<tr>
<td>R J Mcleod</td>
<td>URS</td>
</tr>
<tr>
<td>Robertson Construction Group</td>
<td>The Structural Partnership</td>
</tr>
<tr>
<td>Skanska</td>
<td>Tony Gee</td>
</tr>
<tr>
<td>Sir Rober McAlpine</td>
<td>Waterman</td>
</tr>
<tr>
<td>Technip</td>
<td>Wallace Stone</td>
</tr>
<tr>
<td>Wills Bros Civil Engineering Ltd</td>
<td>Will Rudd Davidson</td>
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<tr>
<td></td>
<td>Woolgar Hunter</td>
</tr>
<tr>
<td></td>
<td>WSP</td>
</tr>
<tr>
<td></td>
<td>Clients (5)</td>
</tr>
<tr>
<td></td>
<td>Historic Scotland</td>
</tr>
<tr>
<td></td>
<td>Network Rail</td>
</tr>
<tr>
<td></td>
<td>Scottish &amp; Southern Energy</td>
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<td></td>
<td>Scottish Water</td>
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<td></td>
<td>Strathclyde Partnership for Transport</td>
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</tbody>
</table>

### Table 2: CE4R Workshop Titles and Partners 2012-2018

<table>
<thead>
<tr>
<th>2012-13 Session</th>
<th>2013-14 Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.Renovation of the Royal Commonwealth Pool Edinburgh (Graham)</td>
<td>8.Tunnelling on the East End Regeneration Route, Glasgow (I &amp; H Brown)</td>
</tr>
<tr>
<td>2.Geotechnical &amp; Foundation Solutions at the Technology Innovation Centre (Lend Lease)</td>
<td>9.Structural Aspects Related to the Installation of Manifolds in the North Sea (Technip)</td>
</tr>
<tr>
<td>3.Replacement of a Railway Bridge Superstructure (URS)</td>
<td>10.The Drawdown of Craigmaddie Reservoir (Scottish Water)</td>
</tr>
<tr>
<td>4.Gleneagles Station Link Road: Route Options (CH2M Hill)</td>
<td>11.Cofferdams at Rosyth CVF Infrastructure Upgrade (BAM Nuttall)</td>
</tr>
<tr>
<td>5.M&amp;E Services &amp; Structural Frames @ Southern General Hospital (Brookfield Multiplex Europe)</td>
<td>12.Design &amp; Construction Issues Concerning (Waterman)</td>
</tr>
<tr>
<td>6.Foundation Arrangements over a Rail Tunnel in Glasgow (Balfour Beatty)</td>
<td>13.Flooding Problems: Getting the Ground Investigation Right (Atkins)</td>
</tr>
<tr>
<td>7.Hydro Intake Dam Design (Scottish &amp; Southern Energy)</td>
<td>14.Structural Engineers, Buildability and Architects (Waterman) &amp; (HLM Architects)</td>
</tr>
<tr>
<td>15. Using CESMM4 on a Bridge Replacement Project (BAM Nuttall)</td>
<td>35. Haymarket Station Project (CH2m)</td>
</tr>
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<td>---------------------------------------------------------------</td>
<td>--------------------------------------</td>
</tr>
<tr>
<td>17. Designing in Buildability &amp; Safety at Eaglesham STW (Laing O’Rourke)</td>
<td>37. The principles/ethos of conservation engineering (David Narro Associates)</td>
</tr>
<tr>
<td>19. Refurbishment of Cathedral Street Bridge: Glasgow (Network Rail)</td>
<td>39. Costing the Borders Railway Project (BAM Nuttall)</td>
</tr>
<tr>
<td>20. The Design of Critical Components on a Suspension Bridge (Forth Estuary Transport Authority)</td>
<td>40. Offshore Wind Turbine Substructure design (ATKINS)</td>
</tr>
<tr>
<td>21. Design of a New Dock (Jacobs)</td>
<td>41. Rail Bridge Replacement during Blockade (Carillion Plc)</td>
</tr>
<tr>
<td>22. Fort Charlotte Perimeter Wall Stabilisation (Historic Scotland)</td>
<td>42. Constructing the Civil Engineering works on a Wind Farm Project (RJ McLeod)</td>
</tr>
<tr>
<td>23. Glasgow Concert Hall: Piling within a live retail environment (Carillion) &amp; (Arup)</td>
<td>43. Queen Street Station Redevelopment: Everything you wanted to Know but were Afraid to ask (Arup)</td>
</tr>
<tr>
<td>24. Costing the Borders Rail Project (BAM Nuttall)</td>
<td>44. Onshore wind farm design and development (Mott MacDonald)</td>
</tr>
<tr>
<td>2014-15 Session</td>
<td>2016-17 Session</td>
</tr>
<tr>
<td>25. Structural Frame @ the Forfar Community Campus (Fairhurst)</td>
<td>45. Design Optioneering for a Structural Frame (Buro Happold)</td>
</tr>
<tr>
<td>26. Civil and Structural Infrastructure of onshore wind farms (Grontmij)</td>
<td>46. Bridging the Gap (AECOM)</td>
</tr>
<tr>
<td>27. City Centre working-geotechnical challenges (Skanska)</td>
<td>47. Selection and assessment of a Wind Farm (SSE)</td>
</tr>
<tr>
<td>28. Edinburgh Glasgow Improvement Programme (EGIP) Advance Works - Larbert Station (AECOM)</td>
<td>48. Risk - its Assessment and Management (McLaughlin &amp; Harvey)</td>
</tr>
<tr>
<td>29. Concept Design Issues-Glasgow City College Campus (Arup) &amp; (Sir Robert McAlpine)</td>
<td>49. M8 M73 M74 Motorway Improvements Project (Lagan)</td>
</tr>
<tr>
<td>30. Structural Engineers Register (ATKINS)</td>
<td>50. A9 Dualling-Stakeholder Management* (Jacobs)</td>
</tr>
<tr>
<td>31. Trunk Road Route Assessment in Scotland (AECOM)</td>
<td>51. Contractor Issues: Cuningar loop footbridge (Robertson Construction Group)</td>
</tr>
<tr>
<td>32. Health &amp; Safety on a Megaproject (FCBC JV)</td>
<td>52. Pier Design on West Coast of Scotland (Wallace Stone)</td>
</tr>
<tr>
<td>33. Wind Turbine Construction in Difficult Ground Conditions (Tony Gee and Partners LLP)</td>
<td>53. Design &amp; Construction Challenges in Tunnelling (COWI)</td>
</tr>
<tr>
<td>34. University of Strathclyde Business School - Understanding Refurbishments and Extensions (The Structural Partnership Ltd) &amp; (Balfour Beatty)</td>
<td>54. Dumfries Learning Town North West Campus-Groundwork’s Problems (Woolgar Hunter)</td>
</tr>
<tr>
<td>2015-16 Session</td>
<td>55. Commercial Management: A Contractors Perspective (Carillion Plc)</td>
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<tr>
<td>-----------------</td>
<td>----------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>56. H&amp;S Risks and Solutions in Nuclear New Build (Jacobs)</td>
<td>63. Ayr Academy 4G Sports pitch. (Kier)</td>
</tr>
<tr>
<td>57. Greenock Health &amp; Care Centre - Overcoming Topography and Contamination Challenges (Baker Hicks)</td>
<td>64. Practicalities of delivering the A9 by 2025 while ensuring Value for Money (Transport Scotland)</td>
</tr>
<tr>
<td>58. Design Issues in Bridge &amp; Flood Projects (WSP)</td>
<td>65. Water of Leith Flood Prevention Scheme in Edinburgh (Arup)</td>
</tr>
<tr>
<td>59. Problems &amp; Solutions in Construction Site Logistics (Graham)</td>
<td>66. Environmental Challenges in Marines Structures (Arch Henderson)</td>
</tr>
<tr>
<td>60. Health &amp; Safety Issues in Contracting (Wills Bros Civil Engineering Ltd)</td>
<td>67. Arran Distillery – Problems with Engineering the Water of Life (Woolgar Hunter)</td>
</tr>
<tr>
<td>61. Constructability Options for Ground Floor slabs (Balfour Beatty)</td>
<td></td>
</tr>
</tbody>
</table>
### Table 3: CE4R Post workshop questionnaire responses 2012-2018

<table>
<thead>
<tr>
<th>Statements about CE4R</th>
<th>Strongly Disagree (%)</th>
<th>Disagree (%)</th>
<th>Neutral (%)</th>
<th>Agree (%)</th>
<th>Strongly Agree (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(n=1477 returned questionnaires from 1571 attendances)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S1. I found the workshop to be interesting.</td>
<td></td>
<td></td>
<td>3</td>
<td>42</td>
<td>55</td>
</tr>
<tr>
<td>S2. I found the workshop to be inspirational.</td>
<td>1</td>
<td>1</td>
<td>18</td>
<td>49</td>
<td>31</td>
</tr>
<tr>
<td>S3. The workshop helped confirm my intentions to become a civil engineer on graduation.</td>
<td>1</td>
<td></td>
<td>16</td>
<td>46</td>
<td>37</td>
</tr>
<tr>
<td>S4. I understood ‘the problem(s)’ that my group were tasked to resolve.</td>
<td>3</td>
<td>11</td>
<td></td>
<td>47</td>
<td>39</td>
</tr>
<tr>
<td>S5. I considered ‘the problem(s)’ to be complex.</td>
<td>5</td>
<td>19</td>
<td></td>
<td>42</td>
<td>34</td>
</tr>
<tr>
<td>S6. During the time spent resolving ‘the problem’ I feel that I / the group undertook a degree of analysis (breaking down of the problem into its constituent parts &amp; examination of these component parts) to resolve the problem.</td>
<td>1</td>
<td>2</td>
<td>15</td>
<td>51</td>
<td>31</td>
</tr>
<tr>
<td>S7. During the time spent on resolving ‘the problem’ I feel that I / the group undertook a degree of synthesis (combining separate simple elements into a complex whole) to resolve the problem?</td>
<td>3</td>
<td>16</td>
<td></td>
<td>55</td>
<td>26</td>
</tr>
<tr>
<td>S8. During the time spent on resolving ‘the problem’ I felt that I / the group engaged in creative thinking.</td>
<td>2</td>
<td>15</td>
<td></td>
<td>53</td>
<td>30</td>
</tr>
<tr>
<td>S9. During the time spent on resolving ‘the problem’ I felt that I used prior knowledge from my university studies.</td>
<td>1</td>
<td>9</td>
<td>22</td>
<td>43</td>
<td>25</td>
</tr>
<tr>
<td>S10. During the time spent on resolving ‘the problem(s)’ I felt that I used prior knowledge from my industrial experience (summer placement, if applicable)</td>
<td>10</td>
<td>8</td>
<td>50</td>
<td>18</td>
<td>14</td>
</tr>
<tr>
<td>S11. As a graduate- I would like to be given the opportunity to present my own workshop to Strathclyde students.</td>
<td>2</td>
<td>2</td>
<td>25</td>
<td>40</td>
<td>31</td>
</tr>
</tbody>
</table>
Selected Verbatim from questionnaires.

Themes

- 1st time attenders
- Challenging for 1st year students
- Presenters
- Relationship to studies
- Supplement course learning
- Helped confirm correct course of study
- More interesting than formal lectures
- Inspirational
- Peer learning
- Fun
- Creative thinking
- Challenging
- Maths & Calculations
- Simulate design team interaction
- Local projects

1st time Attenders

This was my first CE4R and I found it interesting and more entertaining that I had previously though and I’m going to attend more of them.

Just a bit of feedback for you, tonight was my first time in attendance of CE4R and I was thoroughly impressed. Great insight into what life is like beyond university and good to mix with your peers. I think things like this should be encouraged more often and although they cannot substitute lectures, the type of learning is much more enjoyable and interactive.

Just a bit of feedback for you, tonight was my first time in attendance of CE4R and I was thoroughly impressed.

This was my first experience at CE4R and I’ll be looking to make this a weekly event. Working alongside people from different years was helpful to see different ways they were thinking.

First time at CE4R, I’ll be back!

A great exercise. My first time in such a group. Really helpful and enjoyable time.

This was my first experience of a CE4R workshop and it proved to be a valuable one. It has given me a better idea of how civil engineering problems are addressed by industry professionals. It had helped me begin to alter my attitudes to my studies to better gear myself towards a career in civil engineering.

This is the first CE4R I have been to and it really helped put into practice what I’ve learned at uni so far. This was a real life problem that I could encounter when I graduate.

This was my first CE4R workshop. I should have come before. It was enjoyable and informative.
My first CE4R and really very interesting and I thoroughly enjoyed it. It had definitely inspired me to come to future events

My first time attending one. I found it very interesting and informational and I would like to attend another CE4R.

My first time at CE4R and it was very good to apply knowledge to real life problems and to gain more knowledge on industry.

**Challenging for 1st year students**

A really useful workshop as it was complex and involved a lot of group thinking. It was hard for the lower years as they haven’t covered any of what was being discussed.

Was very difficult with being from first year. Would have liked a little bit or prior knowledge.

As a 1st year the problem and the steps to resolving it were too advanced for my current level of knowledge.

Highly complicated for a first-year student but in the end I understood due to my teammates.

This was a good and interesting experience although I could not make much of an input due to lack of knowledge as a first-year student.

Highly complicated for a first-year student but in the end I understood due to my teammates.

Felt like it was too advanced for a first year student.

Really interesting and although as a first year student I though that I would not be able to contribute too much I didn’t feel left out in the discussion. I think that being presented with a real problem / project is a good way to see the connection with my studies gives an idea of what work as a civil engineer looks like.

As a first year I did not feel too knowledgeable but I was still able to contribute.
I enjoyed the experience and being in first year it gave me my first insight into civil engineering in a real world scenario. This gave me a good amount of inspiration and enthusiasm for my future career.

Was very difficult with being from first year. Would have liked a little bit or prior knowledge.

**Presenters**

Very well presented and a useful insight to offshore engineering so helpful to inform decisions after graduating. The presenters did a great job in helping during the evening.

Jamie and Gareth were really enthusiastic and appeared happy about their work. The workshop was inspiring as this showed us difference between a director's role and that of a senior engineer.

It's a great resource and should be encouraged in all years. Get them in early. It was a very useful workshop, especially given it was presented by two engineers who genuinely seem to care and enjoy it.

I’m normally not too comfortable remembering structural engineering concepts, but Ian and Graeme made it seem simple!

It was great to get a presentation and problem form someone who is obviously passionate about his work and clearly has one of the most comprehensive overviews on one of the UK's most important transport link

Really have enjoyed all of the CE4R workshops and this one in particular as Louise was very approachable and a great role model for all engineers

Very well presented and a useful insight to offshore engineering so helpful to inform decisions after graduating. The presenters did a great job in helping during the evening.

I loved learning about offshore wind and the presenters were really helpful and inspiring.

A simple problem but really well put together and a great explanation of the solution. the presenters were really helpful.

**Relationship to studies**

Amazing CE4R, very interesting problem with lots of different possibilities for the design of the building. Very good presentation. Really enjoyed applying some of the things I have learned in class.

A good way to learn, especially when it comes to visualising forces. Andrew Briggs sometimes uses real life examples but most structures lecturers could benefit from using this approach to learning.

Great presentation and explanation. Makes you think outside the box for a good solution and brings the separate knowledge from class together.
I used my skills from Geotechnical class to engage in the problem.

A topic not covered much in class and a welcome introduction to civil engineering in marine environments.

Useful and insightful knowledge that I wouldn’t learn in class.

A good way to learn, especially when it comes to visualising forces. Andrew Briggs sometimes uses real life examples but most structures lecturers could benefit from using this approach to learning.

Good to see where knowledge from the course can be applied to tunnelling.

A good workshop as not a lot of classes’ stress the importance of cost so this got us thinking and it’s never a bad thing to be looking at construction drawings.

My first experience of CE4R. I learned a lot about engineering in practice and could relate this to studies already completed at university.

Just a bit of feedback for you, tonight was my first time in attendance of CE4R and I was thoroughly impressed. Great insight into what life is like beyond university and good to mix with your peers. I think things like this should be encouraged more often and although they cannot substitute lectures, the type of learning is much more enjoyable and interactive.

I used a lot of knowledge learned at the university in structural engineering classes covering steel design. I was very happy to be given a chance to use theory from class in a real civil engineering project.

A very interesting CE4R with a topic not often discussed in lectures. A tricky problem, challenging from more straightforward examples at university.

More time would be good but the topic was very interesting and best for 3rd years onward as we have transport engineering classes.

The problem helped me use skills I have learned in my structural mechanics class to solve real engineering problem and this was very useful.

Very interesting and very similar things discussed as students of in 4th year car park project. Very interesting. Allowed me to be involved with some design aspects of civil engineering, something I had not done before.

I feel like I would do better taking part in CE4R in the future as I don’t have enough overall knowledge from my studies to date and was not sure about aspects of the problem.

A really useful workshop as it was complex and involved a lot of group thinking. It was hard for the lower years as they haven’t covered any of what was being discussed.

I could not use any previous knowledge from my lectures. Which was disappointing

Learned new things that will probably not be taught in lectures.
Supplement course learning

Applicable and relevant. It was really interesting as it’s not a field covered in university so particularly enjoyable because I know nothing about conservation engineering.

A very well though out and interactive task, applicable and relevant to actual work. One of the best workshops I have attended in terms of real life learning. Not a subject often taught at university so it was interesting to learn about the rail industry..

I enjoyed tonight’s workshop, and I think it is better to have the opportunity to learn things that we haven't learned or won't learn in class at CE4R. Although it is good to apply our knowledge from class in the workshops, personally I feel that my CPD is benefitting more from having experience in other aspects of the industry.

I found the workshop really useful - being taken through the things that aren't taught at university, but are very useful knowledge for working in the industry. Also the chance to be taught by a practising engineer currently working in the industry gives a real edge to the situation; reinforced by the real-life examples.

A very well though out and interactive task, applicable and relevant to actual work. One of the best workshops I have attended in terms of real life learning. Not a subject often taught at university so it was interesting to learn about the rail industry..

Overall I found the evening to be very enjoyable. I enjoyed working in teams which had students from all years and I thought that Brian’s task was interesting, yet at a fair level for everyone to have a go at it. I understood the problem and found it to be slightly complex as I was never sure if my ideas were along the right lines as I had no previous knowledge to feel confident in my ideas. This relates to the common issue of not having classes which teach the students how to deal with these issues, hence why the CE4R events are very useful, particularly ones such as this as it gives the students a better insight into things that we don't often hear about in class.
Helped confirm correct course of study

I enjoyed having the chance to practice civil engineering. It reassured me that I am studying the right course.

I think that being presented with a real problem / project is a good way to see the connection with my studies gives an idea of what work as a civil engineer looks like.

It was a great experience that I could feel myself closer to real problems, and taking a pinch of what a ‘real’ civil engineer does on a day to day basis. I think it was very useful and highlighted that we only learn the methods and details how to solve problems, but the basic concepts are more depending on one’s creative thinking. This gave me confidence that I’ve chosen the right course.

CE4R workshops have been great so far. I wish I could enrol for more if there were more places available. Doing those type of problems was the exact reason why I wanted to be a civil engineer, to actually use our knowledge and thinking to solve a real life situation or problem.

The workshop was very good. I liked that the talk beforehand was quite focused towards the exercise with practical hints and advice given as well as background knowledge. I was impressed with the enthusiasm towards civil engineering shown by the speakers and their willingness to share their experience with us which really gave the impression that I am pursuing an interesting and rewarding career.

It was inspirational for me. The project helped me understand more what is needed to be a civil engineer

CE4R has made me think more about exactly what Civil Engineering is and when people ask me to explain exactly what it is I’m doing at university I don’t have to hesitate to answer. People should realise how beneficial this is not just to their CV or CPD, but to their career in the industry as a whole. It really shows you what you could achieve and helps you to confirm your aspirations!

I really enjoyed the experience at CE4R. It’s easy to lose sight of what it’s really like to be working as a civil engineer when you’re stressing about exams and coursework, and CE4R is a great way of helping us realise and remember what we’re all working towards.

I will come to more workshops as they are useful for gaining experience and confidence.

Very well presented and a useful insight to offshore engineering so helpful to inform decisions after graduating. The presenters did a great job in helping during the evening.

More interesting than formal lectures

It was very interesting, lots of maths which got you really thinking and it would be nice to have something like this introduced into lectures as a project.

I really enjoyed CE4R; it was far more interesting than my normal lectures. The problem solving element was particularly interesting. Maybe consider adding a class like that to the
normal curriculum as it is inspiring and gives a clear insight into what civil engineers actually do.

I felt the workshop made the lecture/learning element fun. I think perhaps more of our actual lectures should be more interactive like these.

This is an excellent opportunity for students who wish to be inspired and also to apply their knowledge out with coursework and tutorials. The fact that it is free, yet very useful for a student’s personal development is also a huge plus. Would love to do more of this type of learning during term time.

I would advise any Civil Engineering student to attend as many CE4R workshops as possible. The workshop run by Atkins provided a more interesting and exciting learning experience than most lectures can offer as well as giving an insight into how a real groundwork’s investigation would be managed. The event was well organised and ran smoothly.

I thought the workshop was really interesting and I haven’t ever looked at something like that before so I was interested by it and wanted to find out the solutions as to where the lifts went. I've only been to a couple of these but I think they are a lot more engaging than the lectures we have at the university. It is nice to actual look at and attempt to solve real problems.

An excellent informal experience that helped to apply creative design which we don’t necessarily get to do that often in lectures. Also is a good way to have interactions between year-groups. It was good that the problem wasn’t overly simplistic and still had lots of numbers involved.

A very interesting CE4R with a topic not often discussed in lectures. A tricky problem, challenging from more straightforward examples at university.
Inspirational

An inspirational and eye opening workshop into civil marine engineering.

It was inspirational for me. The project helped me understand more what is needed to be a civil engineer.

The Arup workshop was inspirational and helped improve my understanding of team work.

A workshop that was very inspirational to become a civil & environmental engineer.

I enjoyed the experience and being in first year it gave me my first insight into civil engineering in a real world scenario. This gave me a good amount of inspiration and enthusiasm for my future career.

I find these workshops really helpful and inspirational especially in second year. These helps to have a broad knowledge about the profession therefore one can better choose or orientate to one or another branch of civil engineering. I feel these workshops essential as they give en insight to what a civil engineer have to face on a daily basis.

The presentation was quite inspirational and it was great to see what things are built below sea level, which was hard to imagine. I learned much specially on basic concepts of off-shore building. The second part of the example was a bit too technical, where I couldn’t really use what we’ve learnt so far, but it was inspirational, and the concepts were clear.

Very interesting and inspirational and I enjoyed it thoroughly. Very well presented and I learned a lot, time flew by. Confirmed my ambition to work in oil and gas in Aberdeen. Something new in the CE4R workshop.

I really enjoyed CE4R; it was far more interesting than my normal lectures. The problem solving element was particularity interesting. Maybe consider adding a class like that to the normal curriculum as it is inspiring and gives a clear insight into what civil engineers actually do.

Very inspiring an informative. Interesting to learn about the Bill of Quantities and the use of Spons price guide.

This is an excellent opportunity for students who wish to be inspired and also to apply their knowledge out with coursework and tutorials.

My first CE4R and really very interesting and I thoroughly enjoyed it. It had definitely inspired me to come to future events.

Very informative. It gave me a greater overview of the thinking process deployed in initial conceptual designs. The variations of design were inspiring and it was interesting to see the conceptual ideas optimised.
**Peer learning**

I enjoyed working in groups to solve a problem and I learned a lot from older students' that I had not learnt in class.

It was interesting to learn the approach taken to solve the problem along with how the senior students would approach the problems.

A good introduction to what my course is somewhat about. The older students were really good at explaining things to first-year level.

Working alongside more experienced students was helpful and inspirational.

Working alongside more experienced students was helpful and inspirational.

A good introduction to what my course is somewhat about. The older students were really good at explaining things to first-year level.

I felt the workshop was beneficial as it gave me an opportunity to meet a chartered engineer from industry. I also found it good to be working in a team with students from different years of the course. The certificate at the end was good as this proves that I undertook CPD.

The workshop was good as it gave some insight into the challenges faced in Engineering every day and how there can be many different ways to approach a cost effective and sensible option to put to the client/contractor. For myself, perhaps in future the workshop could involve a little extra challenge for 5th years to crack above the group challenge given but I enjoyed brainstorming with the lower years in my group and giving them some guidance on how to read drawings and construction processes etc.

I really enjoyed the whole experience. It was good to see some of the real problems out on the site. I feel though as a direct entry 2nd year I did not have the experience necessary to tackle the problem effectively but I did learn from watching how the more senior students worked on the problem and shared some of their knowledge. I think this workshop is more suited to 3rd and 4th years but I feel as a 2nd year that even just coming in and watching to get that experience earlier on was a great benefit.

Been great over the semester, and tonight was a great round off to the first semester of the project! It's great to see that no matter how diverse the university backgrounds are of the participants, first years and fifth years can think on the same wavelength, showing how we are all developing our Civil Eng way of thinking.

Overall I felt that my first CE4R workshop was a very enjoyable experience. I found that several different year groups coming together to work on an engineering problem was advantageous to my continued development as an engineer and I was able to learn from others experiences. I felt as a first year taking part in this workshop that naturally my knowledge was not as strong as the other but that was to be expected, but being able to take on board what other are saying and have learnt in the past and apply that to real world problems was beneficial. I also felt that it aided in building my confidence, as an engineer you need to be able to communicate ideas to clients and present what information you have. The fact that we have to present to the guest speakers at the end will be instrumental in making me a better communicator and this will only increase as I take part in more of these workshops.
I also enjoyed working in a group of students from varying years, if feeling a little under pressure to begin with being the most 'mature'. It was good to get input from students at different levels. Additionally, I found it interesting to consider maintenance/future development/emergency access, which are not always focused on in classes.

I enjoyed working in a team with people from other years as I was able to learn from them which helped with my understanding.

A great experience overall it lived up to what I through it would involve, the best way to develop more core skills required when in full time employment is by learning how past problems in construction/engineering have been overcome in real projects like this. Really enjoyed the workshop challenges and presenting our ideas to the professional then receiving feedback, I am looking forward to the next one.

I felt this workshop gave an insight into an area I had never knew existed before in oil & gas and gave me more options for the future. The problem whilst relatively straight forward was good as it was an aspect that was completely new so could try and relate it to previous uni work. Working within a group also allows for a good level of collaboration and enjoy presenting the findings afterwards.

Good to continue to see real world problems with a presentation of possibilities and actual course taken. It was good being able to present our own solutions in front of everyone else, letting us get feedback immediately.

The topic was interesting, as was the presentation. The workshop was challenging and interesting however we could have done with a little more assistance. I really liked the 5th years presenting their solution. The summing up part was good it was good to see the video of how it was done.

It was also good to work with students from other years and gain experience presenting to a small group in a relaxed environment.
A great experience overall, this is what I would like to be working on in the future and this has helped me learn how these everyday design constraints are approached in different ways. This workshop emphasised on vibration control during construction and how designers have to reduce risk associated with such challenges of construction, I feel this was conveyed very well in the overall experience. It provides a friendly relaxed environment where you don’t feel nervous to have your say on what you think is the right answer as everyone is in the same ‘learning’ boat.

It has been a great experience and I enjoyed the group work and discussion and the topic was interesting due to its complex design.

Fun

Enjoyed the workshop and it has expanded my knowledge on elements involved with rail works. The teams were helpful, inspirational and also funny!

Playing with the Knex was brilliant and really fun and a good opportunity to be creative in our design for the turbines.

A really fun task and the use of Knex hands-on made it really enjoyable. One of the best CE4R workshops I have attended.

Was really good fun, felt everyone really worked together as a team to complete the task.

I thought the ce4r was fun, the activities were a good challenge and great example of teamwork.

I found it very interesting and fun and would gladly do it again. I feel I know a little bit more about dams now than before the workshop. I felt the workshop made the lecture/learning element fun. I think perhaps more of our actual lectures should be more interactive like these.

I thought it was an interesting local engineering project overview and the task was a good size given the timescale, giving us a budgeting problem to think about and a bit of fun in building the tunnel. It highlighted the attention to detail we need to always be showing.

Was really good fun, felt everyone really worked together as a team to complete the task.

I thoroughly enjoyed the evening. The speaker was good, the material covered was very interesting and detailed, and the problem involved some thinking, and a lot of group work, as well as providing a bit of fun and competition. As mentioned previously, I am interested in tunnelling, and this evening reaffirmed that interest.

Fun experience, good to listen to actual engineers.

The workshop showed me it is quite fun and challenging. However I think such a project is one in a lifetime. From what the speaker was saying I think working for the Scottish water would be dull. I would like my opinion to be changed to be honest.

My overall experience was good. Richard was great at getting everyone to interact and get into the project. It was good fun as well.
I felt that the workshop was very interesting and it was good fun, it also sparked my interest in the more business related side of civil engineering for example the bill of quantities.

My overall impression was that they were nervous/not used to presenting which is surprising. I think the task was fun and the information they gave us at the beginning was interesting and helpful. I think the only thing which could be improved was their presentation style/volume.

Really fun although a bit too challenging. Prior industry experience would have helped

**Creative Thinking**

Exceptional workshop, very clear and helpful and lost of project planning and creative thinking. This workshop has officially became number 1 from all the ones I have attended, sorry Atkins!

Very interesting and a good opportunity to use creative thinking and problem solving with civil engineers.

The workshop required creative thinking to come up with a solution to what was a challenging problem. However it was rewarding when we found out our solution was similar to what had actually been done on site.

It was a great experience that I could feel myself closer to real problems, and taking a pinch of what a ‘real’ civil engineer does on a day to day basis. I think it was very useful and highlighted that we only learn the methods and details how to solve problems, but the basic concepts are more depending on one’s creative thinking. This gave me confidence that I’ve chosen the right course.

I felt that the workshop gave a great insight into what occurs before, during and after and construction project. It allowed me to gain new knowledge on a topic I had never encountered before and made me think creatively. Struggled slightly to apply previous knowledge to the situation but found it good that I was learning through the process.

The workshop was interesting and challenging. It took me a few minutes to work out what we were being asked to do and I also felt that the problem was complex. As a group we worked well and the older students helped with creative thinking. The Balfour Beatty representatives were helpful in encouraging our ideas and the lecture at the end where they described the construction process in detail was very interesting and I feel that I have gained knowledge from it. Overall I enjoyed the experience.

An excellent informal experience that helped to apply creative design which we don’t necessarily get to do that often in lectures. Also is a good way to have interactions between year-groups. It was good that the problem wasn’t overly simplistic and still had lots of numbers involved.

Overall it was good, although it was probably a stretch out of some people comfort zone as after all it was an IStructE exam. However, it did enable us to have creative thinking and also for us to experience harder problems. Michael clearly had a good wide range of knowledge and his presentation was very detailed and covered a lot of interesting projects.

I thought it was very interesting. The problem of modifying existing buildings is something very common in industry, yet not covered much within the course. The complexity of the problem
was at the right level; easy enough to get to grips with quickly, yet still plenty of scope for creative thinking.

**Challenging**

A nice workshop. I worked in a really cool group. The problem was complex and I had no idea what to do at the beginning but by the end we had found a way.

It was a hard problem but engaging and it was interesting to see an aspect of civil engineering that I have not covered in lectures yet.

I felt it too challenging for a first year student. The other members in my group where way ahead of me analysing and solving the problem. However I liked to be challenged with the little knowledge I possess. I have learned few things which will hopefully useful in the future. Overall I am satisfied with the workshop and I feel I have gained useful knowledge.

Overall I fairly enjoyed this CE4R workshop. I enjoyed hearing the views from an architect and how they differ from an engineer. I found the problem to be quite complicated, and in particular, I personally struggled to read the drawings to the same level of detail as the other members in my group. This made it difficult for me to grasp the concept of what was being asked to do.

A very difficult challenge and we didn’t find the correct solution but thinking through the problem improved my engineering skills.

The complexity of the challenge at first glance was not apparent but finding about how the stations were constructed and how the city as developed around each of the stations made me realise the difficulty of the task at hand.

Made me feel I want to learn more and there is so many this about the technology used in civil engineering that I didn’t know about. I liked being challenged in a group to solve a problem which I consider to be beyond my scope.
I really enjoyed the workshop, the introduction part wasn't boring, the task was challenging and we were shown what was actually done and why; which allowed us to compare our thoughts and proposals with the final designs. The task was really good because we were challenged but not lost.

Challenging and relevant. I found it especially interesting as I have not had any prior experience of roof structure before.

**Maths & Calculations**

I enjoyed the workshop. It was interesting to see that what we learn in Water Engineering 2 is actually used in ‘real life’. It also made us actually put what we learnt into practise, not just learning how to do the equations.

I really enjoyed last night as it involved a bit of maths, which was good rather than just listening and discussing, we have to remember that engineers do have to do maths. Finding out exactly why and how the Forth Road Bridge is failing. I liked seeing the bolt, because on paper you forget the size and scale of the project.

It was an interesting task he set, and it definitely pulled into use a lot of the maths and structural engineering theory we've been doing in class.

Great workshop by Robertson and good to see the importance of engineering judgement outside of what you learn in university, not all calculations.

A good workshop for using calculations combined with theoretical thinking about risk assessment etc and it was good use of university knowledge from soil mechanics, structures, CL120 etc.

A good workshop, timed well to cover the whole task and it was nice to do more calculations than in other CE4R’s.

**Simulate design team interaction**

This was my first CE4R workshop and I really enjoyed it. Even after having experience working on water projects during summer placements with a contractor and a consultant I felt that I was able to learn something new last night. The discussions I experienced last night between my group weren't too dis-similar to what I had experienced working on a similar project while in the design office. To me this highlighted how well CE4R does in giving students the opportunity to experience what life as a civil engineer will be like after graduating or during placements.

Really informative practical workshop giving a good insight into the conceptual design process with a clear task to be solved.

Good overview of offshore engineering. Being challenged to design a structure was exciting and using the Knex made it even better, brought out my inner child!
Really interesting and relevant, especially being a case study of such a massive project. Applicable learning of designing process regarding risk assessment & construction methodology on the side of the designer.

A great experience overall, the best way to develop more core skills required when in full time employment is by learning how past problems in construction/engineering have been overcome in real projects like this. I really enjoyed the workshop challenges and presenting our ideas to the professional then receiving feedback on our ideas. Being in small groups allows ideas to be put forward and discussed which is similar to the process involved in real life design problem.

Local projects

I found it very interesting learn more about one of Glasgow's' most historic and iconic infrastructure project and how the subway network is being upgraded to bring it in line with current accessibility legislation.

It was good to see a local project like Queens Street station being used as a case study.

Very good presenters and good to see a local project.

It was a good way to understand real life geotechnical problems and it was easily understood since it was related to local sites.

It was very interesting, was great having a problem on a project that I've past most days

Interesting to find out about local structures and this helped me understand the design process better.

Very good to see real engineering problems happening locally.

The workshop was interesting as it focusses on a local project that everyone was familiar with.

Local project to me, always see it. Wanted to know about the inside job.
I thought it was a great way to engage my mind in real life problems. It was good to hear about local sites and the problems they must face.

Felt that the workshop was very interesting as ‘the problem’ posed was not only intriguing but was local and relatable.

Quite challenging but very interesting. I really enjoyed this one! I found it really relevant, especially related to big projects happening locally.

Topic discussed directly impacts on me so is very good to be somewhat involved. Very good presenters.